

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Please amend the specification as follows:

On pages 1 and 2, the title should be amended to read [METHOD OF] IMPROVING THERMAL PERFORMANCE IN FLIP CHIP/INTEGRAL HEAT SPREADER PACKAGES USING LOW MODULUS THERMAL INTERFACE MATERIAL.

On page 9, the paragraph between lines 8-17 should be amended to read as follows:

Gel thermal interface material 6, before curing, has properties similar to greases, e.g., a high bulk thermal conductivity (1-20 W/m°K) and a low surface energy. It conforms well to surface irregularities upon being dispersed as a liquid onto the flip chip and/or lid and sandwiched therebetween during assembly of the package, which contributes to thermal contact resistance minimization. After assembly, the package is heated to thermally cure the gel material 6 and laminate it to the flip chip and lid. In the example embodiment curing is conducted at 125°C for one hour. The thickness of the cured gel interface material 6 in the package 1 is on the order of 0.001 – 0.010 inch, but other thicknesses could be used.

IN THE CLAIMS:

Please cancel claims 7, 19 and 25 and amend the claims as follows:

1. (Amended) A semiconductor die package comprising:
 - a semiconductor die;
 - a heat spreader; and
 - a thermal interface material between the semiconductor die and the heat spreader, wherein the thermal interface material has a modulus of elasticity in the range

of 1-500 kPa, and wherein the post end-of-line and post reliability testing thermal resistance of the thermal interface between the semiconductor die and the heat spreader is < 1cm² °C/Watt.

6. (Amended) [The] A semiconductor die package [according to claim 1, wherein the modulus of elasticity of the thermal interface material is > 5 kPa] comprising:

a semiconductor die;
a heat spreader; and
a thermal interface material between the semiconductor die and the heat spreader, wherein the thermal interface material has a modulus of elasticity in the range of >5 kPa-500 kPa, and

wherein the thermal interface material is a cured, crosslinked polymer gel which is filled with material selected from the group consisting of metal and ceramic.

8. (Amended) The semiconductor die package according to claim 1, wherein the thermal interface material is a cured, [lightly] crosslinked polymer gel.

10. (Amended) The semiconductor die package according to claim 8, wherein the thermal interface material has a bulk thermal conductivity of 1-20 W/m°K.

11. (Amended) The semiconductor die package according to claim 1, wherein the thermal interface material has a bulk thermal conductivity of 1-20 W/m°K.

13. (Amended) A method of making a semiconductor die package comprising:

assembling a semiconductor die and a heat spreader with a thermally conductive gel therebetween; and curing the gel to form a thermal interface material which has a modulus of elasticity in the range of 1-500 kPa, and wherein the thermal resistance of the cured gel between the semiconductor die and the heat spreader is <1cm² °C/Watt.

16. (Amended) The method according to claim 13, wherein the gel has a bulk thermal conductivity of 1-20 W/m°K.

18. (Amended) [The] A method of making a semiconductor die package comprising:

[according to claim 13, wherein the modulus of elasticity of the cured gel is > 5 kPa]

assembling a semiconductor die and a heat spreader with a thermally conductive gel therebetween; and

curing the gel to form a thermal interface material which has a modulus of elasticity in the range of > 5 kPa-500 kPa, and wherein the thermal resistance of the cured gel between the semiconductor die and the heat spreader is <1cm² °C/Watt.

24. (Amended) A method of dissipating heat from a semiconductor die package, comprising:

transferring heat from a semiconductor die in a semiconductor die package to a heat spreader in the package with a thermal interface material between the semiconductor die and the heat spreader;

wherein the thermal interface material is a gel which has a modulus of elasticity in the range of 1-500 kPa, and wherein the thermal resistance of the gel is <1 cm² °C/Watt.

26. (Amended) [The] A method of dissipating heat from a semiconductor die package, comprising:

[according to claim 24, wherein the modulus of elasticity of the gel is > 5 kPa]

transferring heat from a semiconductor die in a semiconductor die package to a heat spreader in the package with a thermal interface material between the semiconductor die and the heat spreader;

wherein the thermal interface material is a cured, crosslinked polymer gel which is filled with material selected from the group consisting of metal and ceramic.